

REMARKS/ARGUMENTS

Status of Claims

Claims 1, 2 and 4-26 are pending in the application, with claims 1, 23 and 26 being the only independent claims. Independent claim 1 has been amended. Support for the claim amendments can be found in paragraph [0056] of the specification and in Fig. 2 of the subject application. New claim 26 has been added, which is supported by claim 23 and paragraph [0085] of the specification. No new matter has been added.

Reconsideration of the application, as herein amended, is respectfully requested.

Overview of the Office Action

Claims 1-22 and 25 stand rejected under 35 U.S.C. § 112, second paragraph as being indefinite.

Claims 1-2, 9-14, 16-18, and 23-25 stand rejected under 35 U.S.C. § 102(a) as being anticipated by US Patent Appln. Pub. No. 2003/0012247 (*Chilla*).

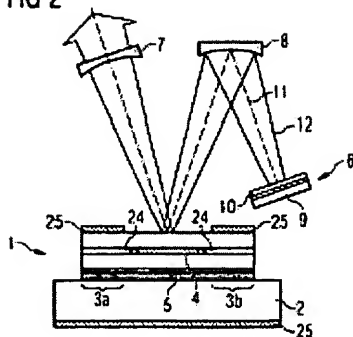
Claims 23 and 24 stand rejected under 35 U.S.C. § 102(a) as being anticipated by WO 01/59895 (*Paschotta*).

Claims 4-8, 15, and 19-20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Chilla* in view of *Paschotta*.

Summary of Subject Matter Disclosed in the Specification

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner as part of the discussion presented herein, and are not intended to argue limitations which are unclaimed. Fig. 2 is reproduced below for the Examiner's convenient reference.

FIG 2



The specification discloses a laser device for generating laser pulses with an optically pumped semiconductor laser (1). The laser device includes a semiconductor laser (1) having an active layer (4), a first pump radiation source (3a, 3b) monolithically integrated into the semiconductor laser (1), an external resonator, and at least one mode-locker (10). The active layer (4) is optically pumped by the monolithically integrated first pump radiation source (3a, 3b). *See, e.g.,* Fig. 2; and paragraphs [0055] to [0058] of the published version of the specification (US Patent Application Publication No. 2004/0190567).

Amendments Addressing Formality Issues

Independent claim 1 has been amended to recite “the first pump radiation source being an edge emitting laser.” In view of the above amendments, the 35 U.S.C. § 112 rejection of independent claim 1 is believed to have been overcome.

Allowability of the Claims

Independent claim 1 is allowable over *Chilla*

Independent claim 1 recites “a first pump radiation source ... configured to optically pump said active layer” and “the first pump radiation source being an edge emitting laser.” Independent claim 1 also recites “at least one mode-locker.” The above recited claim features are not disclosed by *Chilla*.

The cited portions of *Chilla* relates to a semiconductor laser using “an electrically pumped semiconductor gain-structure” (*see*, paragraph [0015] of *Chilla*). In particular, the cited portion of *Chilla* teaches using electrodes 84, 86 causing current to flow through the gain-structure 16 for energizing the same (*see*, paragraph [0035] of *Chilla*). As one skilled in the art will appreciate, electrodes do not emit radiation. Consequently, the electrodes in *Chilla* cannot act as a pump radiation source to optically pump an active layer. Therefore, *Chilla*’s electrodes shown in Fig. 7 are not a pump radiation source, much less edge emitting lasers, for optically pumping the active layer as recited in independent claim 1. Therefore, *Chilla* does not disclose the claim features concerning the “first pump radiation source” as recited in independent claim 1.

Moreover, the cited portions of *Chilla* do not disclose the claim features of “at least one mode-locker” as recited in independent claim 1. In particular, paragraph [0021] of *Chilla* describes the effects of reflected radiation, *e.g.*, radiation reflected at the end of an optical fiber, on the stability of the laser modes. Paragraph [0037] of *Chilla* describes a nonlinear optical crystal arranged in the laser resonator for frequency doubling, *i.e.*, for generating laser light with half the wavelength of the radiation emitted in the active zone. Neither the reflected radiation nor the nonlinear optical crystal in *Chilla* is relevant to the mode-locker recited in independent claim 1. As one skilled in the art will appreciate, a mode-locker is a device for generating short laser pulses. There is no indication in *Chilla* that its device is provided to create short laser pulses. Therefore, *Chilla* does not disclose the claim features concerning the “mode-locker” as recited in independent claim 1.

In view of the above, independent claim 1 is not disclosed by *Chilla*. Withdrawal of the 35 U.S.C. § 102(a) rejection of independent claim 1 is respectfully requested.

Independent claim 23 is allowable over either *Chilla* or *Paschotta*

Independent claim 23 recites “at least one mode-locker” and that “the resonator has a phase compensation element ... compensating for group velocity dispersion.” The above claim features are not disclosed in either *Chilla* or *Paschotta*.

Chilla is conceived to avoid mode-hopping due to optical feedback (*see*, paragraph [0021] of *Chilla* cited by the Office Action). There is no teaching in *Chilla* of a laser device for generating laser pulses or of either a mode-locker or a phase compensation element as is recited in independent claim 23. In paragraph [0037] of *Chilla*, an optical nonlinear crystal is taught for frequency doubling. Such optical nonlinear crystal however, is neither a mode-locker nor a phase compensation element compensating for group velocity dispersion as recited in independent claim 23. Therefore, *Chilla* does not disclose the above recited claim features in independent claim 23.

With respect to *Paschotta*, applicants submit that *Paschotta* does not disclose the above claim features recited in independent claim 23. Applicants submitted detailed remarks and arguments that distinguish independent claim 23 over *Paschotta* in the Amendment filed on April 17, 2007, which apparently have not been considered because no comments by the Examiner relative thereto are of record. Accordingly, applicants hereby re-submit below (*in italics*) their previous remarks and arguments concerning *Paschotta*, and request that they now be considered.

Independent claim 23 recites, inter alia, “said phase compensation element compensating for group velocity dispersion.” Thus, claim 23 does not merely recite a phase compensation element; rather, it recites a phase compensation element that compensates for group velocity dispersion.

As explained in the instant specification, the expression “group velocity” refers to the speed at which the centroid of a wave packet moves in a medium. The dependence of the group velocity

on frequency is referred to as the group velocity dispersion. See paragraph [0066] of the published version of the specification.

As a consequence of the group velocity dispersion -- i.e. the dependence of the group velocity on frequency -- different spectral components will have different propagation times in the resonator. To compensate for this effect, the present invention utilizes a phase compensation element that has different propagation times for different spectral components/wavelengths. In this way, the pulse widths are reduced and sub-picosecond pulses and femtosecond pulses can be generated. See paragraph [0030] of the published version of the specification. The different propagation times for different spectral components/wavelengths result from the refractive index dependence on frequency, e.g., in a prism system or a grating. To compensate for this refractive index dependence on frequency, the optical paths for different spectral components/wavelengths are adjusted so as to be different in the phase compensation element.

Claim 23 is not anticipated by Paschotta because Paschotta fails to disclose, either expressly or inherently, each and every element set forth in claim 23. In particular, Paschotta fails to teach or disclose a phase compensation element which compensates for group velocity dispersion, as applicants recite in independent claim 23.

On page 5 of the Office Action, the Examiner refers to the Abstract and to page 11, lines 15-22 of Paschotta, in support of his allegation that Paschotta discloses a "phase compensation saturable absorber mirror SESAM 5 and/or Bragg reflector compensating for velocity dispersion" (emphasis added).

Applicants disagree.

It is first noted that the above underlined words are neither present in nor are they supported by the cited portions of Paschotta. Rather, these underlined words appear only in the

Examiner's remarks. And the Examiner fails to explain or provide any justification for his allegation that each of the saturable absorber mirror (5) and the Bragg reflector of Paschotta qualifies as a phase compensation element compensating for group velocity dispersion.

As explained in applicants' immediately preceding response, on page 3, lines 10-20 Paschotta teaches the advantages of passive mode-locking in comparison to active mode-locking and teaches that passive mode-locking can be achieved by a saturable absorber mechanism. Paschotta thereafter teaches the use of a semiconductor saturable absorber mirror (5) for passive mode-locking (see, e.g., Abstract; and page 5, lines 10-25 of Paschotta). Thus, Paschotta explicitly teaches the use of the saturable absorber mirror (5) for mode-locking purposes (i.e., to shape and stabilize ultra short pulses). Paschotta wholly fails to teach or disclose or suggest the use of the saturable absorber mirror (5) to compensate for group velocity dispersion.

Moreover, the saturable absorber mirror (5) of Paschotta is not suitable for compensating group velocity dispersion because it does not have different propagation times for different spectral components. The intensity-dependent absorption characteristics of the saturable absorber mirror (5) of Paschotta simply do not, and cannot, have the effect of phase compensation for compensating the group velocity dispersion which is required by applicants' phase compensation element in independent claim 23.

In sharp contrast, claim 23 of the present application expressly recites a "phase compensation element compensating for group velocity dispersion".

In view of these differences, applicants submit that claim 23, and claim 24 which depends from claim 23, are neither anticipated nor rendered obvious by Paschotta or by any of the other art of record in this case.

In view of the above, independent claim 23 is not disclosed by either *Chilla* or *Paschotta*. Withdrawal of the rejections of independent claim 23 is respectfully requested.

Should the Examiner insists that *Chilla* or *Paschotta* discloses the above recited claim features, applicants respectfully request that the Examiner specifies in the next Office Action where in *Chilla* or *Paschotta* such disclosures can be found.

New independent claim 26 is allowable

New independent claim 26 recites the claim features of previously presented claim 23 and that “the phase compensation element is a chirped mirror integrated in a semiconductor body of the semiconductor laser” as is described in paragraph [0085] of the specification.

Neither *Chilla* nor *Paschotta* disclose a phase compensation element in form of a chirped mirror, e.g., a mirror made up of alternating layers with gradually increasing or decreasing thickness, which is integrated in the semiconductor body. In *Chilla*, the optically nonlinear crystal 100 (see, paragraph [0037]), which the examiner seems to regard as a phase compensation element, is neither a chirped mirror nor integrated into the semiconductor body of the semiconductor laser. *Paschotta*, on the other hand, discloses a SESAM 5. The SESAM 5 includes a Bragg mirror with repeating layers 53, 54 of constant thickness, a $\lambda/2$ cavity layer 52 and a quantum well 51 (see, Fig. 3 and page 13, line 22 to page 14, line 6). Such SESAM 5 in *Paschotta* is not a phase compensation element, much less a chirped mirror, as is recited in independent claim 26.

In view of the above, independent claim 26 is believed to be allowable over the cited art.

Dependent claims 2, 4-22, 24 and 25 are allowable

Each of claims 2, 4-22, 24 and 25 depends, directly or indirectly, from independent claim 1 or 23, and as such benefits from its allowability. In addition, these claims include additional

limitations which serve to still further distinguish the claimed invention over the prior art of record. Thus, these dependent claims are allowable.

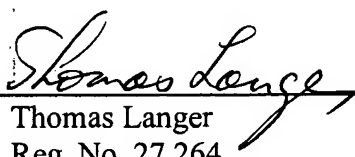
Conclusion

Based on the foregoing, applicants respectfully submit that the present application is now in full and proper condition for allowance. Prompt and favorable action to this effect, and early passage of this application to issue, are once more solicited. Should the Examiner have any comments, questions, suggestions or objections, he is respectfully requested to telephone the undersigned in order to facilitate an early resolution of any outstanding issues.

It is believed that no fees or charges are required at this time in connection with the present application. However, if any fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,

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